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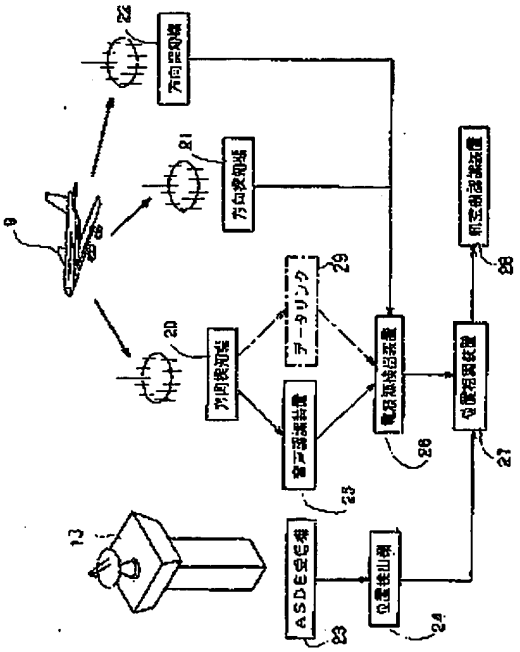
(54)【発明の名称】　空港面における航空機識別方法およびその航空機自動識別装置

(57)【要約】

【目的】　空港において誘導路等を走行している航空機の識別情報を自動的に識別できるようにする方法およびその装置を提供すること。

【構成】　空港用探知レーダにより空港面における各航空機の位置を検出し，空港面のいずれかの航空機が電波を発射した時，少なくとも２箇所に設置された方向探知機により，電波源の位置する電波源領域を決定するとともに，この電波源領域に位置する航空機が１機のみの時，航空機の発射電波の内容からこの航空機の識別情報を選択し，空港用探知レーダにより電波源領域に位置する航空機を特定し，空港用探知レーダの位置情報と方向探知機により識別された航空機の識別情報との相関をとることにより，航空機を自動的に識別している。

【効果】　空港面に存在するすべての航空機の識別情報を自動的にレーダスコープ上に表示することにより，管制官の負担を大幅に軽減できる。



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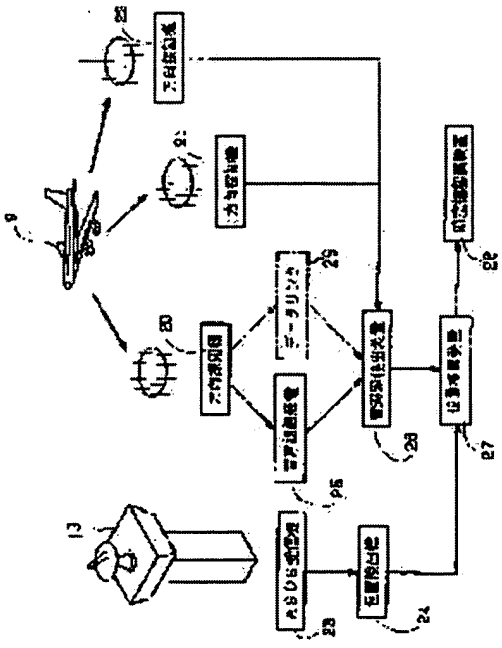
(54) AIRCRAFT DISCRIMINATION METHOD ON AIRPORT PLANE AND ITS AUTOMATIC AIRCRAFT DISCRIMINATING APPARATUS



(57)Abstract:
PURPOSE: To automatically discriminate an aircraft by a method wherein position information on an airport surface detection radar (ASDE) is correlated with discrimination information on the aircraft which has been discriminated by a direction finder.
CONSTITUTION: When an aircraft 9 (a starting aircraft) parked at a spot in an airport starts to meve to a taxiway and enters the coverage region of an ASDE, its reflected waves are received by an ASDE receiver 23, and the sight of the aircraft is displayed on a radarscope. In addition, the sight is computer- processed in a position detector 24, and a precise distance up to the aircraft 9 is decided. When the aircraft 9 starts a call with a control tower 13, radio waves are radiated. The radio waves are received by direction finders 20 to 22 at three places, and a radio-wave source region is estimated. On the other hand, the call content of the aircraft 9 is input to a voice recognition device 25, and discrimination information on an airline name and a flight name is selected. The discrimination information, on the aircraft 9, which is decided in this manner and position information, from the position detector 24, which is obtained by the ASDE are correlated by a position correlation device 27.

DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Industrial Application] This invention relates to the approach and aircraft automatic identification unit which identify automatically identification information, such as an identification code of the aircraft which is running the TWY etc. at an airport.

[0002]

[Description of the Prior Art] while a controller checks the aircraft in an airport by viewing conventionally or checking the sight of an airplane on a radar scope by the detection radar for airports (it is hereafter described as ASDE) -- the knowledge in the inside of the head of this sight of an airplane and a controller -- namely, -- generally -- that location .. .. of a shrine -- it is controlled by recognition that a flight is.

[0003] On the other hand, if the aircraft approaches an airport, as shown in drawing 4 , the identification information of an arriving airplane 1, positional information, etc. will be acquired by the primary monitor radar 2 (it is hereafter described as ASR), or the secondary surveillance radar 3 (it is hereafter described as SSR). When this arriving airplane 1 goes into the last invasion path, based on the automated radar terminal system 4 (it is hereafter described as ARTS), and the operation vote 5 submitted, identification information, such as a facilities name, a firm name, and the time of arrival, is recognized by the flight data processing system (it is hereafter described as FDP).

[0004] Then, as an airport side is shown in drawing 5 , it is the land-cover A1 of ARTS4. Land-cover A2 of ASDE6 There is a duplicate duplication field. In this duplication field, the signal itself detected about the arriving airplane 1 overlaps. Therefore, since the information on an arriving airplane 1 can shift to the ASDE system 6 from ARTS4, identification information, such

as a facilities name of an arriving airplane 1, is obtained from the sight of an airplane on the radar scope of the display 7 currently installed in the airport control tower 13.

[0005] thus -- although in the case of an arriving airplane 1 (aircraft 9) the identification information of this arriving airplane 1 is satisfactory since it is obtained certainly -- spots 8 and 8 -- the case where the aircraft 9 currently parked at an apron to .. leaves -- this outbound aircraft 10 (aircraft 9) -- spots 8 and 8 -- it comes out of .., and although it moves to RWY 12 and being taken off from TWY 11, in the case of such an outbound aircraft 10, the information on ARTS4 is not acquired.

[0006] however, the spots 8 and 8 .. land-cover A2 of ASDE6 the case where it is located inside -- the former -- spots 8 and 8 -- as for the aircraft 9 (outbound aircraft 10) which it is going to leave among the aircrafts 9 currently parked at an apron to .., the identification information of the self aircraft 9 is transmitted to the controller by wireless from the pilot wave of the aircraft 9. Therefore, at the spot 8 of what No., the information what No. is parking at an apron has become clear at the controller. then, a controller -- ASDE6 -- spots 8 and 8 .. supervising -- these spots 8 and 8 -- when which the sight of an airplane starts migration among the aircrafts 9 currently parked at an apron to ..., identification information, such as a facilities name of an outbound aircraft 10, is determined.

[0007] It is the so-called electric shielding field A3 with which the field near just under an airport control tower 13 is not covered by the antenna pattern on the other hand since the antenna of ASDE6 is installed on the high airport control tower 13. It exists. therefore, this electric shielding field A3 the spots 8 and 8 in the range shown -- the information on the aircraft 9 currently parked at an apron in .. is not acquired. therefore, the spots 8 and 8 -- the aircraft 9 currently parked at an apron to .. is undetectable by ASDE6. Therefore, an outbound aircraft 10 is the land-cover A2 of ASDE6. When it enters, even if it is able to check the sight of an airplane of this outbound aircraft 10 by ASDE6, identification information, such as a facilities name of this outbound aircraft 10, cannot be determined. Then, the controller telephoned to the outbound aircraft 10 conventionally, or identification information, such as a facilities name of an outbound aircraft 10, was determined based on the information which the controller recognizes by the FDP5 grade.

[0008]

[Problem(s) to be Solved by the Invention] However, by the approach viewing determines a

facilities name etc., since the aircraft 9 disappears when a weather condition is bad, no aircrafts 9 are certainly discriminable. moreover -- that a controller always checks FDP5 by the approach which a controller determines by the message with FDP5 or the aircraft 9 **** -- always -- spots 8 and 8 -- the aircraft 9 under parking must be grasped to .., and there was a problem that many burdens were placed on a controller too much.

[0009]

[Means for Solving the Problem] When this invention detects the location of each aircraft in an airport side by the detection radar for airports and one aircraft of the airport sides discharges an electric wave, with the direction finder installed in at least two places While determining the radio source field in which a radio source is located, the aircraft located in this radio source field chooses the identification information of this aircraft from the contents of the discharge electric wave of the aircraft at the time only of one set. By the detection radar for airports The aircraft is automatically identified by specifying the aircraft located in a radio source field, and taking correlation with the identification information of the aircraft identified with the positional information and the direction finder of the detection radar for airports.

[0010] Moreover, in order to determine the radio source field in which the detection radar for airports installed in the predetermined part of an airport side and the aircraft which discharged the electric wave are located A means to choose the identification information of the direction finder installed in at least two places, and the aircraft in a radio source field, The radio source detection equipment which determines a radio source field, and the location detection machine which detects the location of the aircraft in a radio source field by the detection radar for airports, The aircraft is automatically displayed on a radar scope with the location correlation equipment which takes correlation with the positional information from this location detection machine, and the identification information of the aircraft, and the aircraft recognition equipment which gives an identification code to the aircraft based on the information from this location correlation equipment.

[0011]

[Function] Each aircraft of an airport side is having the location detected by ASDE. When which aircraft starts a message, the source of discharge of this electric wave is detected by the direction finder installed in at least two places, and a radio source field is determined. When the discharge electric wave of the aircraft located in this radio source field is the message by wireless, the

identification information of this aircraft is chosen from the contents of a message with a voice recognition unit. If correlation between this identification information and the positional information of the aircraft located in the radio source field obtained by ASDE is taken, an identification code can be automatically given to the aircraft.

[0012]

[Example] The example of this invention is explained to a detail based on drawing 1 - drawing 5 . For the block diagram of the aircraft automatic identification unit by this invention, and drawing 2 , the block diagram showing the discernment procedure of the aircraft 9 and drawing 3 are [drawing 1] radio source field A4 by direction finders 20-22. The explanatory view for detecting an estimated position and drawing 4 are the explanatory views of the control system of the whole airport side. In addition, the same name as the conventional example is expressed using the same sign, and omits the explanation.

[0013] It is radio source field A4 in which the aircraft 9 is located as direction finders 20-22 are shown in drawing 3 in drawing 1 - drawing 5 . It is for determining an estimated position and a Doppler direction finder etc. is used. These direction finders 20-22 need to be installed in the location suitable for detecting radio source field A4 (the aircraft 9 being located) at an airport by at least two places.

[0014] 23 is the receiver of ASDE6 and is the land-cover A2 of ASDE6. If the aircraft 9 enters, the reflected wave of the aircraft 9 will be received and the sight of an airplane will be displayed on a radar scope. The location detection machine of the aircraft 9 which has projected 24 on the radar scope of ASDE6, and 25 are the voice recognition units which recognize the voice of the contents of a message of the aircraft 9, extent which recognizes voice required to identify the aircraft 9 at least, for example, an airline name, a facilities name, etc. is enough as them, and other speech recognition is deleted.

[0015] 26 is radio source field A4 in which the aircraft 9 which is radio source detection equipment and discharged the electric wave with direction finders 20-22 is located. An estimated position is detected. 27 is radio source field A4 which is location correlation equipment and was determined with three direction finders 20-22. Correlation with the identification information of the existing aircraft 9 and the positional information of this aircraft 9 detected by ASDE6 is taken, and while the location of the aircraft 9 made into the purpose is pinpointed, identification information, such as an identification code, is given.

[0016] 28 is aircraft recognition equipment, the aircraft 9 containing the arriving airplane 1 and outbound aircraft 10 in an airport side is computer-processed automatically, and a flight name, other altitude, a rate, etc. of each aircraft are displayed with an alphabetic character on a controller's radar scope.

[0017] Next, operation actuation is explained. drawing 4 shows the control system of the aircraft 9 whole containing the arriving airplane 1 and outbound aircraft 10 in an airport, and shows it to drawing 5 -- as -- first -- spots 8 and 8 -- the case where either of the aircrafts 9 currently parked at an apron to .. leaves is explained according to the discernment procedure of the aircraft 9 shown in drawing 2 .

[0018] the spot 8.8 of an airport -- to .., the aircraft 9 is parking at an apron, respectively. Now, the aircraft 9 (outbound aircraft 10) starts migration from a spot 8 to TWY 11, and it is the land-cover A2 of ASDE6. If it enters, while the reflected wave will be received by the ASDE receiver 23 and the sight of an airplane will be displayed on a radar scope, it is processed by the computer in the location detection machine 24, and the exact location of an outbound aircraft 10 is determined.

[0019] An electric wave will be discharged when this outbound aircraft 10 starts a message with the controller of an airport control tower 13 etc. on the occasion of a start. The electric wave discharged from this outbound aircraft 10 is radio source field A4, as it is received by three direction finders 20-22 and shown in drawing 3 . It is presumed.

[0020] Here, radio source field A4 (the error is included) in which an outbound aircraft 10 is located with three direction finders 20-22 although it is not good is presumed, and the bearing accuracy of direction finders 20-22 is this radio source field A4 by radio source detection equipment 26. It is presumed that the aircraft 9 (outbound aircraft 10) probably exists, and it is this radio source field A4. A location is determined. Under the present circumstances, radio source field A4 When there is an existing aircraft 9, when this aircraft 9 is the target outbound aircraft 10, it is specified, and subsequent processing is performed. Radio source field A4 When the existing aircraft 9 is two or more sets, subsequent processing is interrupted as discernment being impossible.

[0021] In addition, since it is opening and running spacing considerably mutually, even if the bearing error of direction finders 20-22 is size, the discernment from the aircraft 9 which is running at spacing longer than this error range, and adjoins mutually is possible for the aircraft 9

which runs TWY 11.

[0022] On the other hand, the contents of a message of the aircraft 9 are inputted into a voice recognition unit 25. Under the present circumstances, while a text with the comparatively easy contents of a message of the aircraft 9 in an airport is a subject, identification information required to identify the aircraft 9, i.e., a firm name, a flight name, etc., is contained in these contents of a message. Therefore, in a voice recognition unit 25, speech recognition of required information, for example, the firm name and facilities name of an outbound aircraft 10, is extracted and carried out, and the identification information of an outbound aircraft 10 is chosen.

[0023] Thus, the identification information of the determined outbound aircraft 10 and the positional information from the location detection machine 24 obtained by ASDE6 are inputted into location correlation equipment 27, both correlation is taken, and the facilities name of an outbound aircraft 10 etc. is attached on the radar scope of aircraft recognition equipment 28.

[0024] Next, the case where the aircraft 9 arrives at an airport is explained. As shown in drawing 4 , an arriving airplane 1 (aircraft 9) approaches an airport, and it is the land-cover A1 of ARTS4. If it enters, identification information, such as the identification information of this arriving airplane 1, for example, a firm name, a flight name, and the time of arrival, will be collated with FDP5, and an arriving airplane 1 will be identified.

[0025] Furthermore, an arriving airplane 1 is the land-cover A2 of ASDE6. If it reaches, the information on an arriving airplane 1 can shift to ASDE6 from ARTS4 similarly with the above-mentioned conventional example having described. Then, the facilities name of an arriving airplane 1 is discriminated from the sight of an airplane on the radar scope of ASDE6, and the firm name of an arriving airplane 1 and a facilities name are displayed on the radar scope of aircraft recognition equipment 28. Therefore, he can recognize an arriving airplane 1 on a radar scope until this arriving airplane 1 parks a controller at an apron at a spot 8 through TWY 11 from RWY 12.

[0026] As an imaginary line shows, when the aircraft 9 equips drawing 1 with the data link function as other examples of this invention and the aircraft 9 (arriving airplane 1) transmits aircraft information in a data link 29, it is radio source field A4 which these contents were decoded, and the aircraft 9 was identified and was calculated with the detection location by ASDE6, and direction finders 20-22. An estimated position is compared. Based on this result, the location and identification information of the aircraft 9 are displayed on the radar scope of

aircraft recognition equipment 28.

[0027]

[Effect of the Invention] When this invention detects the location of each aircraft in an airport side by the detection radar for airports and one aircraft of the airport sides discharges an electric wave, with the direction finder installed in at least two places While determining the radio source field in which a radio source is located, the aircraft located in this radio source field chooses the identification information of this aircraft from the contents of the discharge electric wave of the aircraft at the time only of one set. By the detection radar for airports By specifying the aircraft located in a radio source field, and taking correlation with the identification information of the aircraft identified with the positional information and the direction finder of the detection radar for airports Since the aircraft was identified automatically and the identification information of all the aircrafts that exist in an airport side can be automatically displayed on a radar scope, a controller's burden is sharply mitigable.

CLAIMS

[Claim(s)]

[Claim 1] When the detection radar for airports detects the location of each aircraft in an airport side and one aircraft of said airport sides discharges an electric wave, with the direction finder installed in at least two places While determining the radio source field in which said radio source is located, the aircraft located in this radio source field chooses the identification information of this aircraft from the contents of the discharge electric wave of said aircraft at the time only of one set. By said detection radar for airports The aircraft discernment approach in the airport side characterized by identifying said aircraft automatically by specifying the aircraft located in said radio source field, and taking correlation with the identification information of the aircraft identified with the positional information and said direction finder of said detection radar for airports.

[Claim 2] The aircraft discernment approach in the airport side according to claim 1 characterized by carrying out speech recognition of the contents of a message of this aircraft with a voice recognition unit, and choosing the identification information of said aircraft when said aircraft discharges an electric wave by starting a message.

[Claim 3] The aircraft discernment approach in the airport side according to claim 1 characterized by choosing the identification information of said aircraft from this aircraft information when said radio source is the aircraft information by the data link.

[Claim 4] In order to determine the radio source field in which the detection radar for airports installed in the predetermined part of an airport side and the aircraft which discharged the electric wave are located A means to choose the identification information of the direction finder installed in at least two places, and the aircraft in said radio source field, The radio source detection equipment which determines said radio source field, and the location detection machine which detects the location of the aircraft in said radio source field by said detection radar for airports, The aircraft automatic identification unit characterized by having the location correlation equipment which takes correlation with the positional information from this location detection machine, and the identification information of said aircraft, and aircraft recognition equipment which gives an identification code to said aircraft based on the information from this location correlation equipment.

[Claim 5] The aircraft automatic identification unit according to claim 4 characterized by using the voice recognition unit which recognizes the voice of the contents of a message of this aircraft as a means to choose the identification information of the aircraft in said radio source field.

[Claim 6] The aircraft automatic identification unit according to claim 4 characterized by using the aircraft information by the data link as a means to choose the identification information of the aircraft in said radio source field.